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AFPEA PROJECT NO. 86-P-137

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QUALIFICATION TESTING OF THE
CNU-470/E X-BAND ANTENNA CONTAINER

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JUN 12 1989
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C/b

HQ AFLC/DSTZ
AIR FORCE PACKAGING EVALUATION ACTIVITY
Wright-Patterson AFB OH 45433-5999

May 1989

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ABSTRACT

Aeronautical Systems Division, ASD/VXAL, requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) to design, prototype, and qualify a container for the x-band antenna used on Combat Talon II aircraft.

The CNU-470/E prototype container was designed, fabricated and tested at the AFPEA, HQ AFLC/DSTZ, Wright-Patterson AFB, OH 45433-5999. The container is environmentally sealed with a humidity indicator, desiccant port, and pressure relief valve. The container is designed to protect one x-band antenna during worldwide shipment, storage, and handling.

The container test plan was derived from Military Specification MIL-C-5584D. The tests were conducted in accordance with Federal Test Method Standard No. 101, Military Standard 648, Military Standard 1489, and Military Specification MIL-C-5584D.

Results of the tests conducted on the prototype container are acceptable. The container design will adequately protect one x-band antenna during worldwide shipment and storage.

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INTRODUCTION

BACKGROUND: Aeronautical Systems Division (ASD/VXAL), Wright-Patterson AFB OH 45433-5000 requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) to design, prototype, and perform qualification testing on a x-band antenna container. The CNU-470/E prototype was designed and fabricated at the AFPEA, HQ AFLC/DSTZ, Wright-Patterson AFB, OH 45433-5999.

PURPOSE: The purpose of this project was to determine if the CNU-470/E container design will protect the contents, one x-band antenna for Combat Talon II aircraft, during worldwide shipment, storage, and handling.

TEST SPECIMEN

The CNU-470/E prototype was subjected to extensive testing. The corners of the container were lettered counterclockwise from the aft end where the desiccant port and other accessories are located. (see figure 1).

Design: The CNU-470/E is a controlled-breathing container with a pressure relief valve, humidity indicator, and desiccant port. The container is designed to limit the transmission of shocks to the x-band antenna to 25 Gs when subjected to the conditions in Military Specification MIL-C-5584D. Twelve wide-handle latches are designed to allow quick access to the container contents without the use of tools.

Construction: The container consists of aluminum extrusions for the base walls, the lower cover walls, the wall stiffeners, the stacking interface, and the skid base (see figure 2). Sheet aluminum is used for the upper cover walls, the top and bottom surfaces, and the cradle assembly. PPP-C-1752, Type II, Class 1, (two pound density polyethylene foam) provides cushioning between the cradle assembly, the floor and the cover of the container. A silicone gasket provides a seal between the container base and the container cover.

TEST OUTLINE AND TEST EQUIPMENT

Test Plan: Tests were conducted in accordance with AFPEA Test Plan 86-P-137 (see table 1). The tests used were selected to meet the qualification requirements in Military Specification MIL-C-5584D. Test methods and procedures used were as outlined in Federal Test Method Standard No. 101 (FED-STD-101), Military Standard 648 (MIL-STD-648), Military Standard 1489 (MIL-STD-1489), and Military specification MIL-C-5584D. Any modifications to the standard procedures are noted in the test plan or the results.

Test Loads: All tests were conducted using the x-band antenna test load fabricated at the AFPEA (see figure 3). The test load weighs 95 pounds and simulates the center of gravity and the mass moment of inertia of the x-band antenna as closely as possible.

Test Site: All testing was conducted at the AFPEA, HQ AFLC/DSTZ, Building 70, Area C, Wright-Patterson AFB OH 45433-5999. The equipment required for each test is noted in the test plan.

TEST PROCEDURES AND RESULTS

1. Weight Test

Test Plan No. 1: The container was weighed to determine weight compliance.

Results: The cover weighed 90 pounds, the base weighed 220 pounds, total tare weight of 310 pounds. The results of this test are acceptable.

2. Leak Test

Test Plan No. 2: The pneumatic pressure test was conducted in accordance with FED-STD-101, Method 5009.2 at 1.00 psig. The vacuum retention test was conducted in accordance with FED-STD-101, Method 5009.2 at 1.00 psig. The failure criteria for the test was 0.0250 psig loss during a 30 minute period, after stabilization.

Results: At the end of the 30 minute test period the pressure loss was 0.009 psig. At the end of the 30 minute test period the vacuum loss was .024 psig. The results of this test are acceptable.

3. Rough Handling Tests (+140°F)

a. Test Plan No. 3a: The high temperature cornerwise-drop (rotational) test was conducted in accordance with FED-STD-101, Method 5005.1. The height of the drop was 28 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 18 Gs was obtained during the test.

b. Test Plan No. 3b: The high temperature edgewise-drop (rotational) test was conducted in accordance with FED-STD-101, Method 5008.1. The height of the drop was 28 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 23 Gs was obtained during the test.

c. Test Plan No. 3c: The high temperature pendulum-impact test was conducted in accordance with FED-STD-101, Method 5012. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 19 Gs was obtained during the test.

The container was opened after the pendulum-impact test. Visual inspection revealed no damage to the container or the test load. The results of these tests are acceptable. See appendix 1 for detailed acceleration results.

4. Leak Test

Test Plan No. 4: The pneumatic pressure test was conducted in accordance with FED-STD-101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was a 0.0125 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.001 psig. The results of this test are acceptable.

5. Rough Handling Tests (-20°F)

a. Test Plan No. 5a: The low temperature cornerwise-drop (rotational) test was conducted in accordance with FED-STD-101, Method 5005.1. The height of the drop was 28 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 22 Gs was obtained during the test.

b. Test Plan No. 5b: The low temperature edgewise-drop (rotational) test was conducted in accordance with FED-STD-101, Method 5008.1. The height of the drop was 28 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 20 Gs was obtained during the test.

c. Test Plan No. 5c: The low temperature pendulum-impact test was conducted in accordance with FED-STD-101, Method 5012. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 20 Gs was obtained during the test.

The container was opened after the pendulum-impact test. Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

6. Leak Test

Test Plan No. 6: The pneumatic pressure test was conducted in accordance with FED-STD-101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was a 0.0125 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.002 psig. The results of this test are acceptable.

7. Vibration Fatigue Test

Test Plan No. 7: The vibration fatigue test was conducted in accordance with MIL-STD-648, paragraph 5.3.2. The container was rigidly attached to the platform. A sinusoidal vibration excitation was applied in a vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input from 5 to 12.5 Hz was at 0.125 inch double amplitude and input from 12.5 to 50.0 Hz was at 1.0 G. A 30 minute dwell test was conducted at the resonant frequency.

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 4.6 Gs was obtained at the resonant frequency of 9.0 Hz. The maximum transmissibility obtained was 3.5. The results of this test are acceptable.

8. Leak Test

Test Plan No. 8: The pneumatic pressure test was conducted in accordance with FED-STD-101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was a 0.0125 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.003 psig. The results of this test are acceptable.

9. Repetitive Shock (Superimposed Load) Test

Test Plan No. 9: The repetitive shock test was conducted in accordance with MIL-STD-648, paragraph 5.2.2.1 and FED-STD-101, Method 5019.1. 926 pounds of steel plate was banded to the top of the container to simulate a stacked load. The container was not attached to the platform, but restraining blocks were attached to the platform to prevent the container from moving off the platform. The platform was vibrated at 3 to 5 Hz until the container raised from the platform (1/16 inch feeler gauge clearance between the container bottom and the platform), or a maximum platform acceleration of 1.0 G +/- .1 G was achieved. The test was run at the determined frequency for a period of two hours.

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 5.8 Gs was obtained during the test. The results of this test are acceptable.

10. Leak Test

Test Plan No. 10: The pneumatic pressure test was conducted in accordance with FED-STD-101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was a 0.0125 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.001 psig. The results of this test are acceptable.

11. Superimposed Load Test

Test Plan No. 11: The superimposed load test was conducted in accordance with FED-STD-101, Method 5016.1. A load of 4480 pounds was placed on top of the container through beams placed to simulate actual loading.

Results: Visual inspection revealed no damage to the container. The results of this test are acceptable.

12. Leak Test

Test Plan No. 12: The pneumatic pressure test was conducted in accordance with FED-STD-101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was a 0.0125 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.001 psig. The results of this test are acceptable.

13. Stand Off Test

Test Plan No. 13: The stand off test was conducted in accordance with paragraph 4.7.5.1 of MIL-C-5584D. The cover was set on a concrete surface with the stand offs in contact with the floor. A load of 180 pounds was then placed on top of the cover. With the load removed, the cover was then slid on the stand offs five feet in each of four directions.

Results: Visual inspection revealed no deflection or deformation with the 180 pound load on top. No physical damage resulting in a loss of functional performance was found following the sliding. The results of this test are acceptable.

14. Mechanical Handling Tests

a. Test Plan No. 14a: The forklift handling test was conducted in accordance with FED-STD-101, Method 5011.1, paragraph 6.2. 810 pounds was placed on top of the container to simulate two stacked containers. 1x4 inch boards were used since the forklift used has hard rubber tires. Place the base on the cover to verify forklift entry from all four sides while stacked.

Results: During the test the container was stable riding on the tines. Visual inspection revealed no damage to the container. Forklift entry was possible on all four sides of a stacked container. The results of this test are acceptable.

b. Test Plan No. 14b: The forklift pushing test was conducted in accordance with FED-STD-101, Method 5011.1, paragraph 6.5.

Results: Visual inspection revealed no functional damage to the container. The results of this test are acceptable.

c. Test Plan No. 14c: The forklift towing test was conducted in accordance with FED-STD-101, Method 5011.1, paragraph 6.6.

Results: Visual inspection revealed no functional damage to the container. The results of this test are acceptable.

15. Hoisting Strength Test

a. Test Plan No. 15a: The single ring hoisting test was conducted in accordance with MIL-STD-648, paragraph 5.8.5. The loaded container was lifted by a lift ring and suspended for five minutes.

Results: Visual inspection of the container revealed no damage or deformation. The results of this test are acceptable.

b. Test Plan No. 15b: The 4 ring hoisting strength test was conducted in accordance with MIL-STD-648, paragraph 5.8.3. The container was loaded with 1670 additional pounds and hoisted by all four lift points simultaneously and left hanging for five minutes.

Results: Visual inspection revealed no damage to the container. The results of this test are acceptable.

16. Leak Test

Test Plan No. 16: The pneumatic pressure test was conducted in accordance with FED-STD-101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was a 0.0125 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.002 psig. The results of this test are acceptable.

17. Cover Handle Pull Test

Test Plan No. 17: The cover handle pull test was conducted in accordance with paragraph 4.7.4.1 of MIL-C-5584D. One handle was used to lift the 90 pound cover off the ground. A 140 pound weight was placed in the cover to give a total weight of 250 pounds. The cover was maintained in that position for 5 minutes.

Results: Visual inspection revealed no deflection or permanent deformation to the cover handle or the container cover. The results of this test are acceptable.

18. Puncture Resistance Test

Test Plan No. 18: The pendulum puncture test was conducted in accordance with MIL-STD-1489A, Method 505. The test apparatus used was a simulated forklift tine weighing 70 pounds suspended by wire cables. The tine was pulled straight back until it reached a height of 28 inches above its equilibrium height and released. The tine impact was made to each side and end of the unrestrained container at one half inch above the forklift pocket.

Results: Visual inspection revealed no functional damage to the container. The results of this test are acceptable.

19. Leak Test

Test Plan No. 19: The pneumatic pressure test was conducted in accordance with FED-STD-101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was a 0.0125 psig loss during a 15 minute period.

Results: There was no pressure loss during the 15 minute interval. The results of this test are acceptable.

CONCLUSIONS

The CNU-470/E prototype container provided protection for the contents when tested in accordance with the container test plan.

RECOMMENDATIONS

Safe for worldwide shipment and storage of one x-band antenna.

TABLE 1. CONTAINER TEST PLAN.

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)				AFPEA PROJECT NUMBER 86-P-137	
CONTAINER SIZE (L x W x D) (INCHES)		WEIGHT (LBS)		CUBE (CU. FT.)	DATE
INTERIOR:	EXTERIOR:	GROSS:	ITEM:		
	46 x 35 x 36.5		95		24 Jan 89
ITEM NAME Combat Talon II X-Band Antenna			MANUFACTURER Emerson Electric		
CONTAINER NAME CNU-470/E			CONTAINER COST		
PACK DESCRIPTION Aluminum Container					
CONDITIONING As noted below.					
TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION	
1.	<u>WEIGHT TEST</u> *(4.7.10)	Container cover weight shall not be greater than 100 lbs. Total container weight should not be greater than 325 lbs.	Fully assembled container including shock isolation system.	Scale	
2.	<u>LEAK TEST</u> FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 1.00 PSI and vacuum retention at 1.00 PSI. .025 PSI leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply/vacuum pump.	Water manometer	
3.	<u>ROUGH HANDLING TESTS (HIGH TEMPERATURE +140°F)</u>				
a.	FED-STD-101 Method 5005.1 (4.7.8)	Cornerwise-drop (rotational) test. Condition at +140°F for not less than 24 hours. Drop height 28 inches. Peak resultant acceleration shall not exceed 25Gs.	One drop on diagonal bottom corners, total of two drops.**	Tri-axial accelerometers	
b.	FED-STD-101 Method 5008.1 (4.7.8)	Edgewise-drop (rotational) test. Condition at +140°F for not less than 24 hours. Drop height 28 inches.	One drop on two adjacent bottom edges, total of two drops.***	Tri-axial accelerometers	
COMMENTS: * Figures in parenthesis () refer to paragraphs in MIL-C-5584D. ** Remaining corner drops to be performed in Test No. 5a. *** Remaining edge drops to be performed in Test No. 5b.					
PREPARED BY: <i>Susan Hughey</i> SUSAN HUGHEY, Mechanical Engineer			APPROVED BY: <i>Ted Hinds</i> TED HINDS, Chief, Design Br., AFPEA		

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)				AFPEA PROJECT NUMBER 86-P-137	
CONTAINER SIZE (L x W x D) (INCHES)		WEIGHT (LBS)		CUBE (CU. FT.)	QUANTITY
INTERIOR:	EXTERIOR:	GROSS:	ITEM:		DATE
	46 x 35 x 36.5		95		24 Jan 89
ITEM NAME Combat Talon II X-Band Antenna			MANUFACTURER Emerson Electric		
CONTAINER NAME CNU-470/E				CONTAINER COST	
PACK DESCRIPTION Aluminum Container					
CONDITIONING As noted below.					
TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION	
c.	FED-STD-101 Method 5012 (4.7.8)	Peak resultant acceleration shall not exceed 25Gs. Pendulum-impact test. Condition at +165°F. Temperature of shock mitigation system at time of test shall be +140°F (+10/-0°F). Impact velocity 7 ft/sec, drop height 9 inches. Peak resultant acceleration shall not exceed 25Gs.	One impact on a side and a end, total of two impacts.*	Tri-axial accelerometers, Thermo-couples	
4.	<u>LEAK TEST</u> FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure with 1.00 PSI. Test duration not less than 15 minutes with .0125 PSI leakage allowed.	Ambient	Water manometer	
5.	<u>ROUGH HANDLING TESTS (LOW TEMPERATURE -20°F)</u>				
a.	FED-STD-101 Method 5005.1 (4.7.8)	Cornerwise-drop (rotational) test. Condition at -20°F for not less than 24 hours. Drop height 28 inches. Peak resultant acceleration shall not exceed 25Gs.	One drop on diagonal bottom corners, total of two drops.**	Tri-axial accelerometers	
COMMENTS: * Remaining impacts to be performed in Test No. 5c. ** These corners are opposite those impacted in Test No. 3a.					
PREPARED BY: SUSAN HUGHEY, Mechanical Engineer			APPROVED BY: TED HINDS, Chief, Design Br., AFPEA		

AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER

86-P-137

CONTAINER SIZE (L x W x D) (INCHES)
INTERIOR: EXTERIOR:

46 x 35 x 36.5

WEIGHT (LBS)
GROSS: ITEM:
95

CUBE (CU. FT.)

QUANTITY

DATE

24 Jan 89

ITEM NAME

Combat Talon II X-Band Antenna

MANUFACTURER

Emerson Electric

CONTAINER NAME

CNU-470/E

CONTAINER COST

PACK DESCRIPTION

Aluminum Container

CONDITIONING

As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION
b.	FED-STD-101 Method 5008.1 (4.7.8)	Edgewise-drop (rotational) test. Condition at -20°F for not less than 24 hours. Drop height 28 inches. Peak resultant acceleration shall not exceed 25Gs.	One drop on two bottom edges, total of two drops.*	Tri-axial accelerometers
c.	FED-STD-101 Method 5012 (4.7.8)	Pendulum-impact test. Condition at -65°F. Temperature of shock mitigation system at time of test shall be -20°F (+0/-10°F). Impact velocity 7 ft/sec, drop height 9 inches. Peak resultant acceleration shall not exceed 25Gs.	One impact on a side and a end, total of two impacts.**	Tri-axial accelerometers, Thermo-couples
6.	<u>LEAK TEST</u> FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure with 1.00 PSI. Test duration not less than 15 minutes with .0125 PSI leakage allowed.	Ambient	Water manometer
7.	<u>VIBRATION FATIGUE TEST</u> MIL-STD-648 Para 5.3.2 (4.7.7.1)	Input excitation of 0.125 inch double amplitude or 1G, whichever is less.	Rigidly attach container to exciter. The use of straps	Tri-axial accelerometers,

COMMENTS: * These edges are opposite those impacted in Test No. 3b.
** These impacts are opposite those conducted in Test No. 3c.

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SUSAN HUGHEY, Mechanical Engineer

APPROVED BY:

TED HINDS, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)					AFPEA PROJECT NUMBER 86-P-137	
CONTAINER SIZE (L x W x D) (INCHES)		WEIGHT (LBS)		CUBE (CU. FT.)	QUANTITY	DATE
INTERIOR:	EXTERIOR:	GROSS:	ITEM:			
	46 x 35 x 36.5		95			24 Jan 89
ITEM NAME Combat Talon II X-Band Antenna				MANUFACTURER Emerson Electric		
CONTAINER NAME CNU-470/E					CONTAINER COST	
PACK DESCRIPTION Aluminum Container						
CONDITIONING As noted below.						
TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION		
8.	<u>LEAK TEST</u> FED-STD-101 Method 5009.2 (4.7.2)	Sweep approximately logarithmically from 5 to 50 Hz (about 1/2 octave/min) for 7-1/2 minutes. Then dwell 30 minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency.	is prohibited.	Thermocouples		
		Pneumatic pressure with 1.00 PSI. Test duration not less than 15 minutes with .0125 PSI leakage allowed.	Ambient	Water manometer		
9.	<u>REPETITIVE SHOCK (SUPERIMPOSED LOAD)</u> MIL-STD-648 Para. 5.2.2.1 FED-STD-101 Method 5019.1 (4.7.7.3)	Test for not less than two hours at 3 to 5 Hz or 1G, whichever is less. Banding of containers shall be through the forklift pockets and in the channels across the top of the container. Peak resultant	Ambient	Tri-axial accelerometers		
COMMENTS:						
PREPARED BY: SUSAN HUGHEY, Mechanical Engineer				APPROVED BY: TED HINDS, Chief, Design Br., AFPEA		

AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER

86-P-137

CONTAINER SIZE (L x W x D)(INCHES)

INTERIOR:

EXTERIOR:

46 x 35 x 36.5

WEIGHT (LBS)

GROSS:

ITEM:

95

CUBE (CU. FT.)

QUANTITY

DATE

24 Jan 89

ITEM NAME

Combat Talon II X-Band Antenna

MANUFACTURER

Emerson Electric

CONTAINER NAME

CNU-470/E

CONTAINER COST

PACK DESCRIPTION

Aluminum Container

CONDITIONING

As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION
10.	<u>LEAK TEST</u> FED-STD-101 Method 5009.2 (4.7.2)	acceleration shall not exceed 25Gs. Pneumatic pressure with 1.00 PSI. Test duration not less than 15 minutes with .0125 PSI leakage allowed.	Ambient	Water manometer
11.	<u>SUPERIMPOSED LOAD</u> FED-STD-101 Method 5016.1 (4.7.6.1)	Calculate load in accordance with 6.1. Load equals load on bottom container times a factor of safety of 2. Stack for 60 minutes at ambient temperature.	Bottom container is under test.	Record changes, i.e. buckling, deformations.
12.	<u>LEAK TEST</u> FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure with 1.00 PSI. Test duration not less than 15 minutes with .0125 PSI leakage allowed.	Ambient	Water manometer
13.	<u>STAND-OFF TEST</u> (4.7.5.1)	Place load two times the cover weight on cover. The cover shall not deform or deflect. With load removed, slide cover on the stand-offs five feet in each of four different directions. There shall be no damage to the sealing surface.	Place container cover on a concrete floor resting on the stand-offs.	Visual inspection

COMMENTS:

PREPARED BY:

SUSAN HUGHEY, Mechanical Engineer

APPROVED BY:

TED HINDS, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)						AFPEA PROJECT NUMBER 86-P-137	
CONTAINER SIZE (L x W x D) (INCHES)			WEIGHT (LBS)		CUBE (CU. FT.)	QUANTITY	DATE
INTERIOR:		EXTERIOR:	GROSS:	ITEM:			
		46 x 35 x 36.5		95			24 Jan 89
ITEM NAME Combat Talon II X-Band Antenna					MANUFACTURER Emerson Electric		
CONTAINER NAME CNU-470/E						CONTAINER COST	
PACK DESCRIPTION Aluminum Container							
CONDITIONING As noted below.							
TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS			CONTAINER ORIENTATION	INSTRUMENTATION	
14. a.	<u>HANDLING TESTS</u> FED-STD-101 Method 5011.1 Paragraph 6.2 (4.7.5)	Forklift handling test. Add to container 810 pounds of superimposed load. Lift container(s) off ground with tines inclined 15° and stack restrained to prevent sliding. Carry 100 ft in 23 seconds. Place parallel 1 inch thick boards 54 inches apart in the path as follows: 30 ft from the start, square to the path; 60 ft from the start, at a 60° angle such that the left wheel strikes first; 90 ft from the start, at a 75° angle such that the right wheel strikes first. The container(s) shall remain stable on the tines during the test. There shall be no structural damage. Stack one container on top of another container and verify fork tine entry capability from each of 4 sides.			Ambient	Visual inspection	
COMMENTS:							
PREPARED BY: SUSAN HUGHEY, Mechanical Engineer					APPROVED BY: TED HINDS, Chief, Design Br., AFPEA		

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)				AFPEA PROJECT NUMBER 86-P-137	
CONTAINER SIZE (L x W x D) (INCHES)		WEIGHT (LBS)		CUBE (CU. FT.)	DATE
INTERIOR:	EXTERIOR:	GROSS:	ITEM:	QUANTITY	
	46 x 35 x 36.5		95		24 Jan 89
ITEM NAME Combat Talon II X-Band Antenna			MANUFACTURER Emerson Electric		
CONTAINER NAME CNU-470/E				CONTAINER COST	
PACK DESCRIPTION Aluminum Container					
CONDITIONING As noted below.					
TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION	
b.	FED-STD-101 Method 5011.1 Paragraph 6.5 (4.7.5)	Forklift pushing test. The forklift tines should extend under but not support the container. Push on hard surface 35 ft in 85 seconds. There shall be no structural damage.	From one side and one end of container.	Visual inspection	
c.	FED-STD-101 Method 5011.1 Paragraph 6.6 (4.7.5)	Forklift towing test. Pull by towing rings 100 ft in 23 seconds. There shall be no structural damage.	From ends of container only.	Visual inspection	
15.	<u>HOISTING STRENGTH TEST</u>				
a.	MIL-STD-648 Para. 5.8.5 (4.7.4)	Single ring hoisting test. Hoist container at one lift point and leave hanging for five minutes. There shall be no damage or permanent deformation.	Ambient	Visual inspection	
b.	MIL-STD-648 Para. 5.8.3 (4.7.4)	Four ring hoisting test. Hoist container loaded to five times the gross weight of a single container by all lift points simultaneously and leave hanging for 5 minutes. There shall be	Ambient	Visual inspection	
COMMENTS:					
PREPARED BY: SUSAN HUGHEY, Mechanical Engineer			APPROVED BY: TED HINDS, Chief, Design Br., AFPEA		

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)						AFPEA PROJECT NUMBER 86-P-137		
CONTAINER SIZE (L x W x D) (INCHES)			WEIGHT (LBS)		CUBE (CU. FT.)	QUANTITY	DATE	
INTERIOR:		EXTERIOR:	GROSS:	ITEM:				
		46 x 35 x 36.5		95			24 Jan 89	
ITEM NAME Combat Talon II X-Band Antenna					MANUFACTURER Emerson Electric			
CONTAINER NAME CNU-470/E					CONTAINER COST			
PACK DESCRIPTION Aluminum Container								
CONDITIONING As noted below.								
TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION				
16.	<u>LEAK TEST</u> FED-STD-101 Method 5009.2 (4.7.2)	no damage or permanent deformation. (Legs of the sling should be 30° from the horizontal). Pneumatic pressure with 1.00 PSI. Test duration not less than 15 minutes with .0125 PSI leakage allowed.	Ambient	Water manometer				
17.	<u>COVER HANDLE PULL TEST</u> (4.7.4.1)	Apply a force of 250 lbs on a cover handle in four directions that service loads are possible. There shall be no damage or permanent deformation.	Ambient	Scale				
18.	<u>PUNCTURE RESISTANCE TEST</u> MIL-STD-1489A Method 505 (4.7.4)	Impact will be made at a point 1/2 inch above the enclosed forklift pocket of the container base. There shall not be any damage affecting container performance.	One impact to each side and each end of the container base, total of four impacts.	Visual inspection				
COMMENTS:								
PREPARED BY: SUSAN HUGHEY, Mechanical Engineer					APPROVED BY: TED HINDS, Chief, Design Br., AFPEA			

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)					AFPEA PROJECT NUMBER 86-P-137	
CONTAINER SIZE (L x W x D)(INCHES)		WEIGHT (LBS)		CUBE (CU. FT.)	QUANTITY	DATE
INTERIOR:	EXTERIOR:	GROSS:	ITEM:			
	46 x 35 x 36.5		95			24 Jan 89
ITEM NAME Combat Talon II X-Band Antenna				MANUFACTURER Emerson Electric		
CONTAINER NAME CNU-470/E				CONTAINER COST		
PACK DESCRIPTION Aluminum Container						
CONDITIONING As noted below.						
TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS		CONTAINER ORIENTATION	INSTRUMENTATION	
19.	LEAK TEST FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure with 1.00 PSI. Test duration not less than 15 minutes with .0125 PSI leakage allowed.		Ambient	Water manometer	
COMMENTS:						
PREPARED BY: SUSAN HUGHEY, Mechanical Engineer				APPROVED BY: TED HINDS, Chief, Design Br., AFPEA		

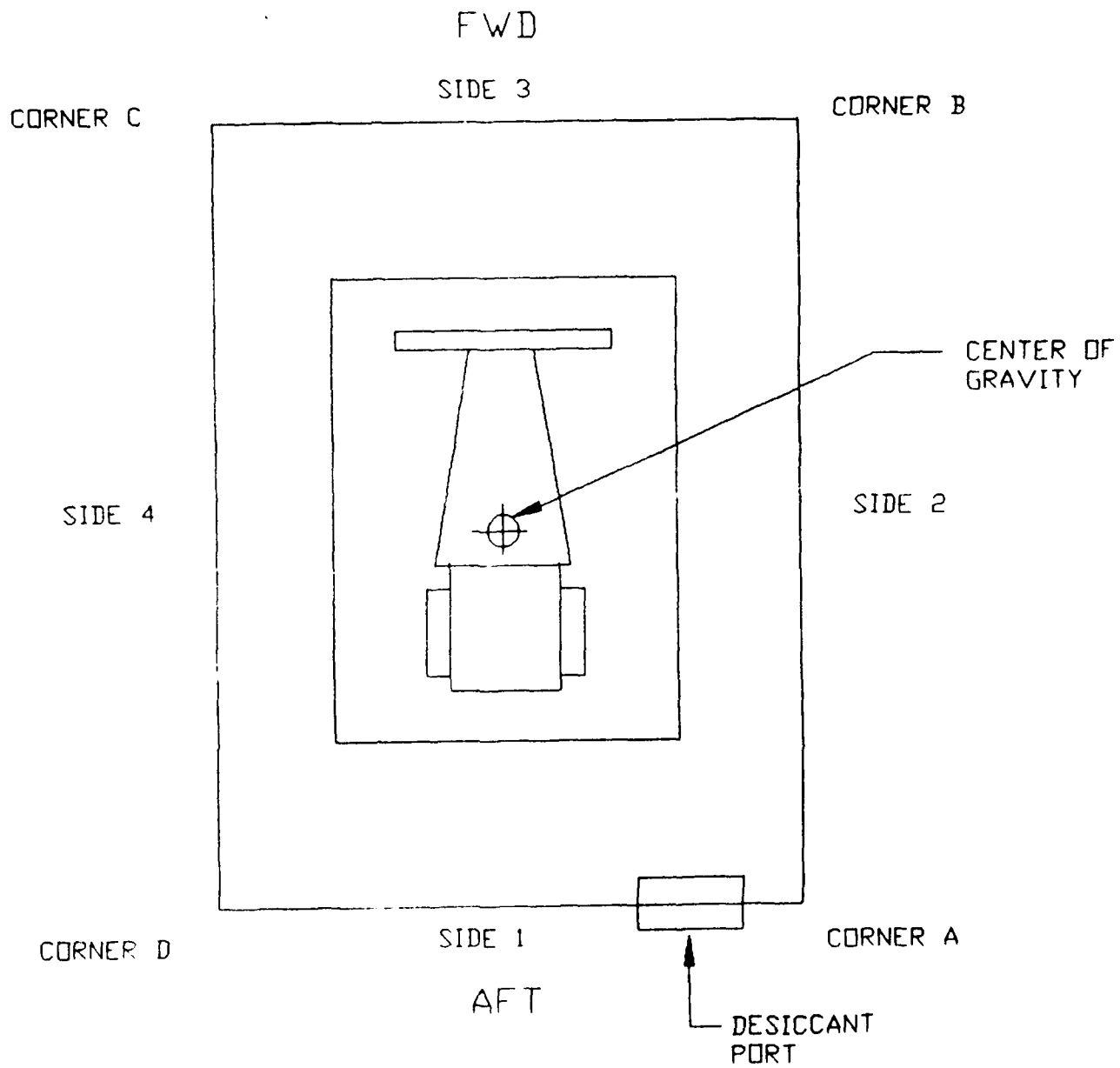


FIGURE 1 - CNU-470/E Corner Numbering

Figure 2

CNU-470/E
Prototype
Container.

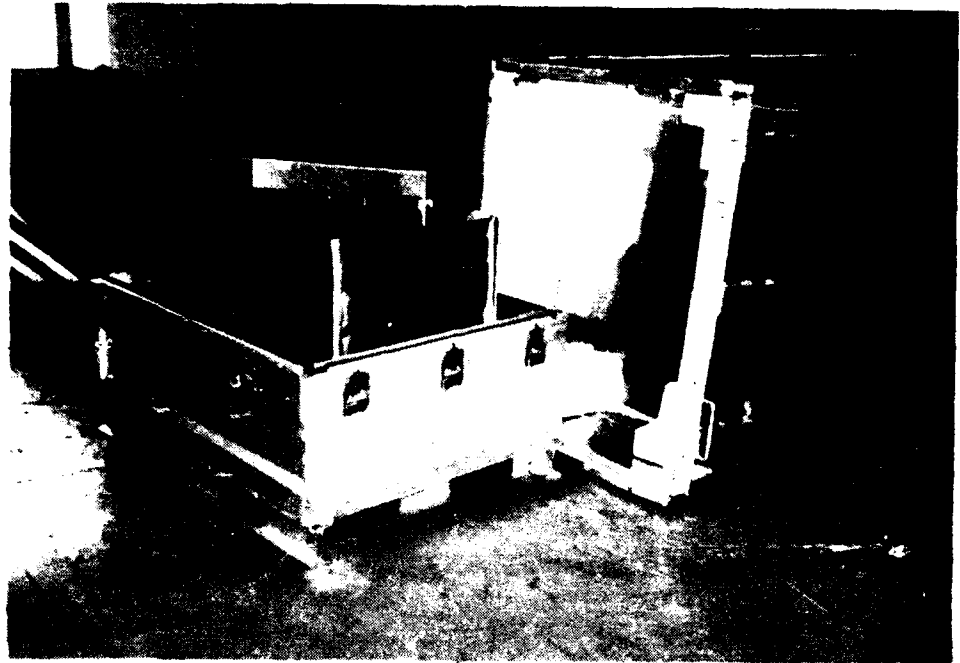
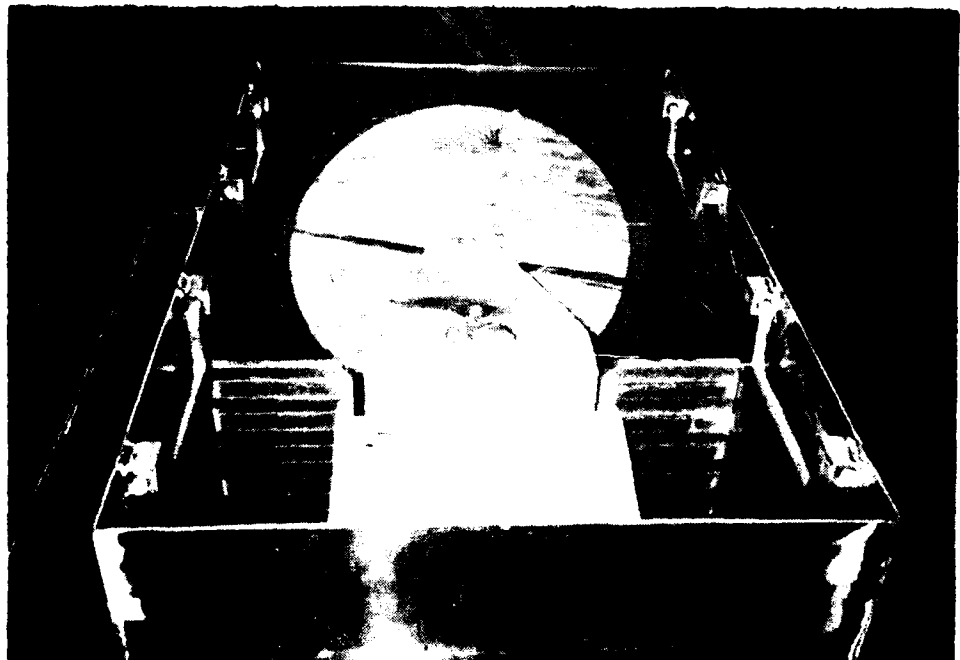


Figure 3

CNU-470/E
Test Load.



DISTRIBUTION LIST

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SA-ALC/DSTD Kelly AFB TX 78241	1
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DLSIE/AMXMC-D US Army Logistics Mgt Ctr Ft Lee VA 23801-6034	1
US Army ARDEC/SMCAR-AEP Dover, NJ 07801-5001	1
HQ DLA/OWO Cameron Station Alexandria, VA 22304-6145	1
ASD/VXAL Wright-Patterson AFB OH 45433	2
ASD/VXA Wright-Patterson AFB OH 45433	1

CNU-470/E CONTAINER - DETAILED ACCELERATION RESULTS

HIGH TEMPERATURE ROUGH HANDLING TESTS (+140⁰ F)

Impact	Position	Accelerometer readings (Gs)		
		Fore	CG	Aft
28" rotational drop	Corner D	13	9	12
28" rotational drop	Corner B	18	10	9
28" rotational drop	Side 3	23	13	7
28" rotational drop	Side 4	16	12	10
7 ft/sec pendulum-impact	Side 3	19	11	9
7 ft/sec pendulum-impact	Side 2	10	10	11

1. No damage to the container or the test load.

LOW TEMPERATURE ROUGH HANDLING TESTS (-20⁰ F)

Impact	Position	Accelerometer readings (Gs)		
		Fore	CG	Aft
28" rotational drop	Corner C	22	13	11
28" rotational drop	Corner A	16	13	17
28" rotational drop	Side 2	20	15	15
28" rotational drop	Side 1	12	12	20
7 ft/sec pendulum-impact	Side 1	18	16	17
7 ft/sec pendulum-impact	Side 4	20	15	19

1. No damage to the container or the test load.

VIBRATION FATIGUE TEST

Natural frequency 9.0 Hz
(input: 0.65G peak, 0.125 inch double amplitude)

	Fore	CG	Aft
Maximum Acceleration (Gs, peak to peak)	4.6	3.9	3.4
Maximum Transmissibility	3.5	3.0	2.6

1. No damage to the container or the test load.